Chinese Mitten Crabs in the Delta

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The Chinese mitten crab (*Eriocheir sinensis*) is native to coastal rivers and estuaries of the Yellow Sea. It was accidentally introduced to Germany in the early 1900s and has spread throughout much of northern Europe. Mitten crabs were first collected in South San Francisco Bay in 1992 and spread rapidly throughout the estuary; they were collected in San Pablo Bay in the fall of 1994, Suisun Marsh in February 1996, and the Delta in August 1996. The mitten crab is catadromous, as it rears in fresh water and reproduces in salt water. Based on the impacts of mitten crabs in their native range and Europe, they pose several possible threats to the estuary, including damage to banks and levees by their burrowing activity; damage to rice fields by consuming rice shoots and burrowing; competition with other aquatic invertebrates, including crayfish, which support a commercial fishery in the Delta; and damage to commercial fishing nets and catch when captured in large numbers.

From late August through late November 1996, 45 mitten crabs were collected from the Delta, Suisun Bay, and Suisun Marsh. Sixteen were collected at the Skinner Fish Facility, nine at the Tracy Fish Facility, three by trawl nets, and one at the Contra Costa Power Plant at Antioch. The remaining 16 were caught incidentally by sportfishers using a variety of baits, ranging from grass shrimp to mudsuckers and shad. Sportfishers consistently commented that mitten crabs are a nuisance, as they are persistent in stealing bait.

The first mitten crabs reported in late August and early September 1996 were caught by sportfishers in the lower Sacramento River, from Rio Vista to Decker Island, and in Threemile and Sevenmile sloughs (Figure 1) and collected by trawl in Suisun Marsh. From mid-September to mid-October, crabs were collected in the interior Delta, lower San Joaquin River, and at both fish facilities. From late-October through late-November, they were caught by sportfishers in Suisun Bay and collected at the Contra Costa Power Plant and both fish facilities. The last mitten crab was reported from Skinner Fish Facility on November 19 and from Suisun Bay on November 25. All crabs caught by sportfishers and collected by trawls were from water more than 6 meters deep, with most from the deeper channels.

Male crabs dominated the collections from the Delta, with 24 males, 13 females, and 8 not sexed (Table 1). The sex ratio did not change over

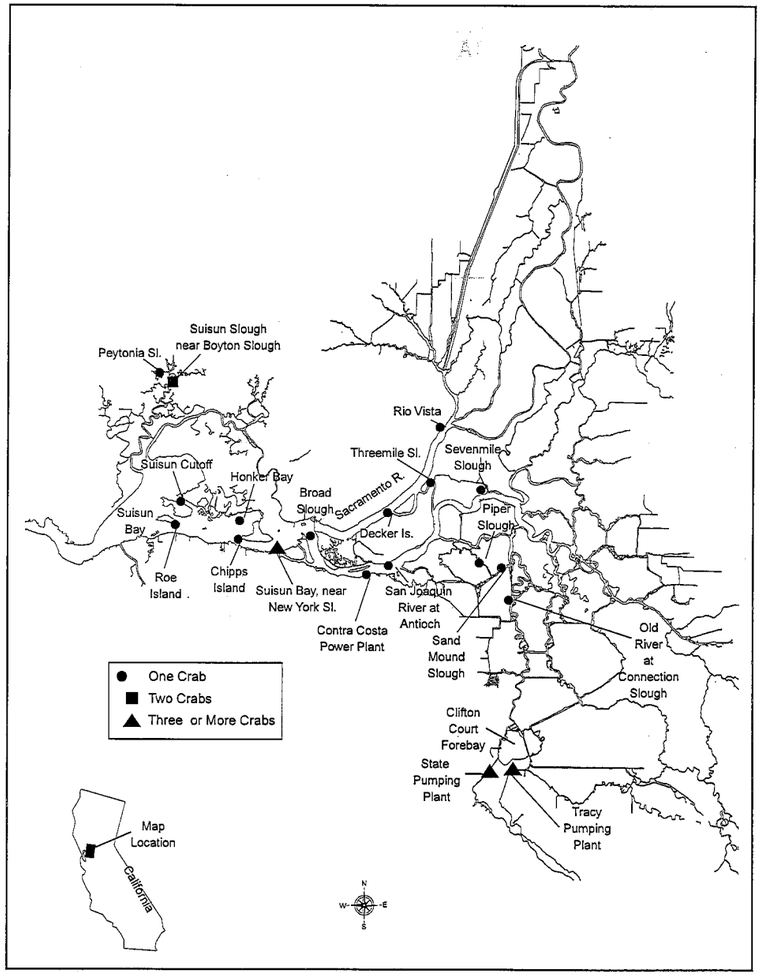

Figure 1
CHINESE MITTEN CRAB COLLECTIONS IN THE DELTA, SUISUN BAY, AND SUISUN MARSH, AUGUST 31 - NOVEMBER 25, 1996

time. Males were 47-87mm carapace width, with two crabs at 47 and 50mm and all others larger than 60mm. Females were 60-79mm CW. We assumed that all of the larger crabs (>60 mm) had completed their terminal molt and were 2 or 3 years old, but more size frequency and size at molt data are needed to confirm the age of all the size classes. Mean size of the crabs collected increased over time; average size of males was 68mm in September, 77mm in October, and 84mm in November.

Table 1
COMPOSITION OF MITTEN CRABS COLLECTED IN THE DELTA, FALL 1996

	Males	Females	Not Sexed
September	6	4	3
October	12	7	5
November	6	2	0
Total	24	13	8

Most of the mitten crabs collected were mature and had reared in the Delta, possibly somewhat upstream of the points of capture. To date, no juvenile crabs have been collected or observed in the Delta, Suisun Bay, or Suisun Marsh, even though DFG surveyed the upper portion of creeks and sloughs in Suisun Marsh for juvenile mitten crabs and their burrows in June and July 1996. The burrowing activity, nocturnal habits, and primarily vegetative diet of juveniles makes them difficult to detect at low densities with visual surveys, trawls, or trapping. As mitten crabs mature, they consume more animal material, including bait. This change in food habits, combined with a concentration in channels as they stage or start their downstream migration, makes adult mitten crabs more vulnerable to capture than the juveniles.

These collections have also helped us understand the timing and duration of downstream migration and other aspects of mitten crab life history. The migration period extended from late August through late November, with the earlier crabs collected upstream, and the majority of the later crabs collected in Suisun Bay. This migration period and pattern concurs with what has been reported in Germany (Panning 1938). The preponderance of males throughout the migration period was unexpected, as females were believed to migrate later (as for many catadromous species, male mitten crabs migrate downstream before the females). Other researchers have reported that mitten crabs mature as they migrate downstream, but reproduce in brackish water. The females collected in September had undeveloped ovaries, while the females collected in October and November had well developed ovaries. Bay shrimp fishers caught adult mitten crabs, including ovigerous females, in their trawl nets beginning in late October. They have reported the crabs to be a nuisance in their trawls, with catches as high as 200 crabs/tow. They are also concerned that consistently large catches of mitten crabs will damage their nets and catch.

Based on the growth of the mitten crab population in South Bay sloughs, where burrow densities as high as 30/m2 were reported in 1996 (K. Halat, pers. comm.), we expect a population "explosion" in the Delta within several years. Although we cannot predict the extent and nature of the impacts of a large population of mitten crabs in the estuary, they have already become a nuisance to sportfishers and bay shrimp fishers and may soon become an economic burden to shrimp fishers. As the population grows, we will have ample opportunity to gather additional data, including distribution, burrow densities, size frequency, food habits, behavior, and reproduction cycle. This information will help us develop a more complete understanding of mitten crab life history in the estuary, predict and quantify their impacts, and develop control measures if necessary.

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Literature

Panning, A. 1938. The Chinese mitten crab. Annual Report Smithsonian Institution, pp 361-375.